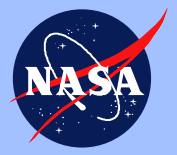


NGST

Beyond HST: The Next Generation Space Telescope

Peter Stockman

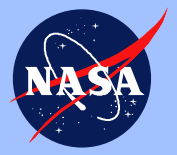
33rd Space Congress

NGST will follow HST and SIRTF in ~2006

- The Hubble Space Telescope will reach its 15 year lifetime in 2005, having accomplished most of the key scientific programs addressable by a 2.4m diameter optical telescope in space.
- The Space InfraRed Telescope Facility will extend sensitive observations into the deep infrared (but with less sensitivity than HST).
- The SIRTF Mission lifetime is constrained by the size of its cryogenic dewar to ~ 2.5 yr..

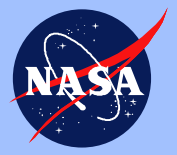
NASA NGST Study

- NASA is studying the feasibility of a large, passively cooled telescope to extend HST-type sensitivity and resolution into the infrared.
  - The NGST Study is commissioned by the Origins Program in NASA HQ.
  - Goddard Space Flight Center and the Space Telescope Science Institute are leading the multi-center, industry, and academic study.



The Origins of Stars and Galaxies

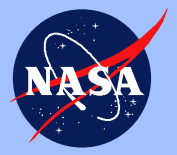
- **HST and mammoth groundbased telescopes can now image the brightest galaxies at distances/times which predate the birth of our solar system.**
- **But to see the earliest formation of stars and galaxies, we must look in the infrared:**
  - **the cosmological "doppler-shifts" move the wavelengths from 0.5 microns to > 2 microns.**
  - **above 2 microns, the glare from our atmosphere and room temperature optics overwhelm these faint images.**



The NGST uses Cosmic Cooling

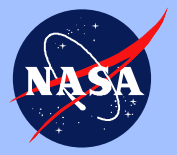
Current plans call for NGST to be launched to L2: about 1.5 million km opposite the Sun from Earth.

- Behind several sunshades, the deployable optics will cool to ~ 30-60K, permitting ultrasensitive observations from 1 to 15-30 microns.
- The speed improvement over telescopes on Earth is between 100-1,000,000 even neglecting atmospheric absorption.



Won't it cost Billions?

- By using passive cooling, we eliminate the need for large, heavy cryogenics -- except perhaps for detectors.
- The low disturbance, L2 orbit permits the use of ultralightweight optics and inflatable shields.
- Modern controls technology can measure and correct the figure of the optics on a periodic basis as well as damp out vehicle vibrations.
- A 6-8m dia. deployable NGST will fit inside a 3.75m dia. Atlas IIAS shroud.

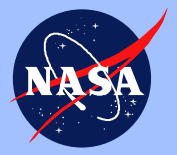


Advances in Materials and Technology have enabled the NGST mission.

- CVD SiC, Sintered SiC, Be, and multimaterial structures offer several possible paths:
  - Each has achieved the required lightweighting (10-20kg/m2) compared to HST (>500 kg/m2).
  - Each can be polished to the required precision.
  - Each has been cycled to cryogenic temperatures.
- Precision optical control has been demonstrated for large mirror segments (ALOT) and on groundbased telescopes (STARFIRE).

Technology Advances since HST (Cont.)

- Precision, active control of structures has been demonstrated in the lab(JPL) and in space (MIT).
- Large inflatable, self rigidizing structures have a heritage in NASA and DoD programs.
- These new materials and technologies will be shared by all new NASA missions: “faster, better, cheaper” + large optics.



The Next Steps

- NASA will fund the independent concept study of the NGST mission by two industry/academia teams to complement the NASA-led effort this summer. By September, the best parts of each study will be integrated into a single concept.
- The study results will be presented to NASA and the National Academy of Sciences in the Fall of 1997.